

What is claimed is:

- 1 1. A downhole tool for determining the properties of a fluid comprising:
2 a downhole tool deployed in a well bore formed in an adjacent formation,
3 the tool interacting with a downhole fluid;
4 a resonator associated with the downhole fluid;
5 a controller for actuating the resonator;
6 a monitor for receiving a response from the resonator to the actuation of
7 the resonator such that the response is associated with the fluid; and
8 a processor for estimating a value of a property for the downhole fluid.

- 1 2. The downhole tool of claim 1, further comprising:
2 a chemometric equation for estimating a fluid property value.

- 1 3. The downhole tool of claim 1, further comprising:
2 a function applying the resonator response to a chemometric equation to
3 determine a fluid property value.

- 1 4. The downhole tool of claim 1, further comprising:
2 a function for deriving a chemometric equation from measured resonator
3 response correlated with known fluid property values.

- 1 5. The downhole tool of claim 1, wherein the parameter value is viscosity.
- 1 6. The downhole tool of claim 1, wherein the parameter value is density.
- 1 7. The downhole tool of claim 1, wherein the parameter value is dielectric
2 constant.
- 1 8. The downhole tool of claim 1, wherein the parameter value is resistivity.
- 1 9. The downhole tool of claim 1, further comprising:
2 applying the chemometric estimated parameter value to a Levenberg-
3 Marquardt (LM) algorithm to determine a fluid parameter value for the
4 fluid.
- 1 10. The downhole tool of claim 10, wherein the fluid parameter value
2 comprises a global minimum for the LM algorithm.
- 1 11. A method for determining the properties of a fluid downhole comprising:
2 deploying a tool in a well bore formed in an adjacent formation;
3 interacting with a downhole fluid with a resonator associated with the tool;
4 actuating the resonator;
5 receiving a response from the resonator to the actuation of the resonator
6 associated with the fluid; and

7 estimating a value of a property of the downhole fluid based on the
8 resonator response.

1 12. The method of claim 11, further comprising:
2 estimating a fluid property value with a chemometric equation.

1 13. The method of claim 11, further comprising:
2 applying the resonator response to a chemometric equation to determine a
3 fluid property value.

1 14. The method of claim 11, further comprising:
2 deriving a chemometric equation from measured resonator response
3 correlated with known fluid property values.

1 15. The method of claim 11, wherein the parameter value is viscosity.

1 16. The method of claim 11, wherein the parameter value is density.

1 17. The method of claim 11, wherein the parameter value is dielectric
2 constant.

1 18. The method of claim 11, wherein the parameter value is resistivity.

1 19. The method of claim 11, further comprising:
2 applying the chemometric estimated parameter value to a Levenberg-
3 Marquardt (LM) algorithm to determine a fluid parameter value for the
4 fluid.

1 20. The method of claim 19, wherein the LM algorithm calculated fluid
2 parameter value comprises a global minimum for the LM algorithm.

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1 21. A computer readable medium having computer instructions that when
2 executed performing a method for determining the properties of a fluid
3 comprising :
4 interacting with a downhole fluid with a resonator associated with the tool;
5 actuating the resonator;
6 receiving a response from the resonator to the actuation of the resonator
7 associated with the fluid; and
8 estimating a value of a property of the downhole fluid based on the
9 resonator response.

1 22. The method of claim 21, further comprising:
2 estimating a fluid property value with a chemometric equation.

1 23. The medium of claim 21, further comprising:

2 applying the resonator response to a chemometric equation to determine a
3 fluid property value.

1 24. The medium of claim 21, further comprising:
2 deriving a chemometric equation from measured resonator response
3 correlated with known fluid property values.

1 25. The medium of claim 21, wherein the parameter value is viscosity.

1 26. The medium of claim 21, wherein the parameter value is density.

1 27. The medium of claim 21, wherein the parameter value is dielectric
2 constant.

1 28. The medium of claim 21, wherein the parameter value is resistivity.

1 29. The medium of claim 21, further comprising:
2 applying the chemometric estimated parameter value to a Levenberg-
3 Marquardt (LM) algorithm to determine a fluid parameter value for the
4 fluid.

1 30. The medium of claim 29, wherein the LM algorithm calculated fluid

2 parameter value comprises a global minimum for the LM algorithm.

1 31. A system for determining the properties of a fluid comprising:

2 a surface controller for lowering a down hole tool deployed in a well bore
3 formed in an adjacent formation, the tool interacting with a down hole
4 fluid;

5 a resonator associated with the down whole fluid;

6 a controller for actuating the resonator;

7 a monitor for receiving a response from the resonator to the actuation of
8 the resonator such that the response is associated with the fluid; and

9 a processor for estimating a value of a property for the down whole fluid.